

Remarks/Arguments

Examiner Shakeri is thanked for his consultation and efforts during the examiner interview of November 14, 2006.

Examiner Shakeri is thanked for the thorough Office Action.

Applicant respectfully requests entry of the amendments.

In the Claims

Claims 37, 38, 43, 47, 48 and 50 are amended to provide proper antecedent basis for the CMP retaining ring.

Claim 37, lines 6 – 8 is amended. For support see claims 39 and 40, see figs 3A, 3B, 4A. This amendment further clarifies what was already claimed and is not a further narrowing of the claim.

Claim 37 add a whereby clause in the last line. For support see spec. p.. 11, LL 14 – 16; p. 12 , LL 20-21.

Parent claims 37, 50 and 55 are amended to delete “~~or slanted cross-sectional contour.~~”

Claim 39 is amended. For support see figures 3A, 3B, 4A. The first inner and outer peripheral openings are shown in all the figures in the applicant figures are implicit in the previous claim 39 limitation “said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface;”.

Claim 40 is amended. For support see claim 37 and see figs 3A, 3B, and 4A.

Claim 41 is amended. For support see figs 3A, 3B, and 4A.

Claim 42 is amended. The amendment clarifies the existing limitation and make explicit what is implicit. For support see figs 3A, 3B, and 4A.

Claim 44 is amended. For support see figures 4A, 4B and 4C.

Claim 50 is amended. For support see claims 39 and 40, see figs 3A, 3B, and 4A. This amendment further clarifies what was already claimed and is not a further narrowing of the claim. This amendment makes explicit what is implicit.

Claim 51 is amended. For support see figs 3A, 3B, and 4A.

Claim 54 is amended. For support see figs 3A, 3B, and 4A.

Parent method claim 55 is amended. claims 39 and 40, see figs 3A, 3B, 4A. This amendment further clarifies what was already claimed and is not a further narrowing of the claim. This amendment makes explicit what is implicit.

Claim 57 is amended. The first inner and outer peripheral openings are shown in all the figures in the applicant are implicit in the previous claim 39 limitation "said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface;"

Dependent claim 59 is amended. For support see claims 56 and 57; See figure 4A, 4B and 4C.

No new matter is added.

Applicant respectfully requests entry of the amendments for the potential purposes of appeal.

Premature Final Office Action

The representative respectfully submits that the finality of the instant office action is premature. It is thought that the current Office Action should have been issued a non-final Office Action. This is because the 35 U.S.C. § 102 rejections in first Office Action should have been overcome by the arguments in the first Office Action.

In the 1st non-final Office Action dated 6/8/2006, only Lai figure 18 was shown (and no cited to Lai spec were given). Clearly Lai figure 18 does not meet applicant's claims. The representative did not amend the claim in previous response because the Office Action did not show or explain why Lai 18 meet the applicant's claims under 35 U.S.C. § 102. It appeared that at least some claims were not anticipated.

For example, previous unamended claim 39 states “said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface”. Communicate means to join or connect. This is not shown in Lai figure 12 or 18. No dimple 80 communicates with the inner peripheral surface or the outer peripheral. All dimples shown in Lai do not touch the inner peripheral surface or the out peripheral surface. See Lai figure 12 and 18. No dimple 80 or group of dimples communicates between the inner peripheral surface and the outer peripheral surface. No “two of more“ dimples 52 communicate with the inner peripheral surface. No group of dimples 52 communicates with the outer peripheral surface. Therefore the applicant’s parent claims were not anticipated by the Lai cites in the first Office Action (Lai figures 12 or 18).

Unamended Claim 40 was not met by Lai. Claim 40 states: “said plurality of grooves are uninterrupted extending from said inner peripheral surface to said outer peripheral surface;”

Unamended Claim 42 was not met by Lai. Claim 42 stated “said plurality of grooves have a semicircle profile along the entire length extending from said inner peripheral surface to said outer peripheral surface. “

Unamended claim 50 has similar limitations.

Therefore representative respectfully posits that this current final office action is premature because the claims were not adequately twice rejected for the same reasons. It appears that in the instant final Office Action dated 9/25/2006 makes new arguments on page 4, para 8 that cite new figures in Lai that were not cited in the first Office Action. When new reference citations are used, even if it the same reference, it is a new rejection and should not be a final rejection.

Amendements raise no new issues

The representative respectfully maintains that these amendments do not raise new issues. First, as mentioned above, it is thought that the present office action should not be final. In addition, the amendments to the parent claims and dependent claims are limitations

already found in existing dependent claims. The amendment make explicit what was already implicitly claimed.

For these reasons, the adding of limitation already present in the dependent claims, into the patent claims, the current amendments raise no new issues.

EXAMPLES OF SOME NON-LIMITING EMBODIMENTS

Applicant's figure 3A shows a non-limiting example embodiment.

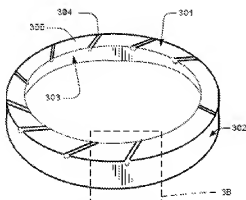


FIGURE 3A

Applicant's figure 3B shows an aspect of a non-limiting embodiment:

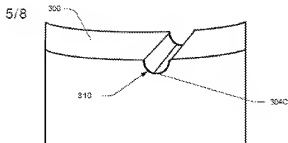


FIGURE 3B

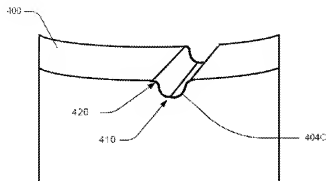


FIGURE 4B

Embodiment with rounded top corners – see e.g., claim 43

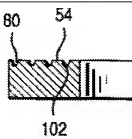
Rejection of Claims 37-42, 44, 46, 50-52, 54-57, 59 and 60 under 35 U.S.C. 102(b) as being clearly anticipated by Lai et al. (6,224,472).

The rejection of Claims 37-42, 44, 46, 50-52, 54-57, 59 and 60 under 35 U.S.C. 102(b) as being clearly anticipated by Lai et al. (6,224,472) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested in view of the amendments and comments below.

Claim 37 states:

37. (CURRENTLY AMENDED) A CMP retaining ring, comprising:
an inner peripheral surface;
an outer peripheral surface;
a lower surface adapted to contact and depress an upper surface of a polishing pad during chemical mechanical polishing of a lower surface of a substrate;
a plurality of grooves on said lower surface of said CMP retaining ring;
each groove of said plurality of grooves continuously extends entirely across the lower surface extending from said inner peripheral surface to said outer peripheral surface;
said plurality of grooves are spaced apart;
said plurality of grooves include at least a first groove and a second groove;
at least a portion of said first groove not adjacent to the lower surface has a rounded cross sectional contour ~~or slanted cross sectional contour~~; whereby the rounded cross sectional contour reduces the accumulation of particles in the grooves that reduces microscratches.

The instant Office Action on page 2 urges:

<p>Lai et al. discloses all of the limitations of claims 37, 50 and 55, i.e., retaining ring accommodating a wafer in a CMP comprising grooves extending from exterior of the ring towards the interior and having a semi-circular profile. (Emphasis added)</p>	 <p>Lai Figure 18</p>
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Page 4 of the instant Office Action states:

Applicant's arguments filed September 8, 2006 have been fully considered but they are not persuasive.

The argument that Lai et al. fails to disclose grooves extending to the outer surface, because the dimples shown in Fig. 12 indicate so, is in error. Lai et al. clearly discloses grooves extending from the inner surface to the outer surface, see Figs. 4, 6, 8, 11, 14 and 20. It is also noted, the whole point of grooves in a retaining ring as disclosed by Lai et al. is to direct slurry to the bottom of the workpiece from the surface of the polishing pad, as it is clearly known to one of ordinary skill in the art.

US 6224,472 -Lai does not suggest all the limitations of claims 37, 50, and 55

Applicant argues that a careful close reading of US 6224,472 – and especially Lai Figs. 4, 6, 8, 11, 14, 18 and 20. Lai reveals that Lai does not show or suggest all the limitations of amended claims 37, 50, and 55. At least two limitations that Lai does not meet or suggest is Claim 37 states:

- **“ at least a portion of said first groove has a rounded cross sectional contour” and**

“each groove of said plurality of grooves continuously extends entirely across the lower surface extending from said inner peripheral surface to said outer peripheral surface; “

Parent claims 50 and 55 have similar non-obvious limitations.

Lai does not show any groove with the applicant’s claimed limitation of 1) a rounded cross sectional contour 2) that extends continuously from said inner peripheral surface to said outer peripheral surface”

Overall, no figure or words in Lai meet the applicant’s parent claim limitation. First, Lai figure 18 shows dimple, not grooves that extend across the ring. Second, as the Office Action notes, “Lai et al. clearly discloses grooves extending from the inner surface to the outer surface, see Figs. 4, 6, 8, 11, 14 and 20.” However, Lai Figs. 4, 6, 8, 11, 14 and 20 do not show or suggest any of applicant’s claimed **““ at least a portion of said first groove not adjacent to the lower surface has a rounded cross sectional contour”**.

Figure 18 shows dimples that do not extend across the width of the ring

Lai figure 18 shows “dimples” 80 is a cross sectional view. As shown in top down view Lai figure 12, these dimples only extend across a portion of the Lai retaining ring. (see Lai col. 14, L 21-23;). Lai’s dimples 80 do not extend to either the inner peripheral surface of the ring or to the outer peripheral surface of the ring. See Lai figures 18 and 12. The dimples stop before touching/meeting/joining with the peripheral surfaces. That is there is top surface space between the dimples 80 and the peripheral surface. Therefore Lai does not meet or suggest applicant’s parent claims 37 50 and 55.

Lai col. 14, lines 21-23 state:

Examples of other possible configurations include, but are not limited to, dimpled surface characteristics made up of a plurality of dimples 80 as shown in FIG. 12 and FIG. 18

Lai col. 7, L 55-58 states:

FIG. 12 is a simplified perspective view of a CMP retaining ring having arcuate dimpled surface characteristics according to one embodiment of the disclosed method and apparatus.

.. Lai col. 8, L 16-29 state:

FIG. 18 is a simplified cross sectional view of the CMP retaining ring of FIG. 12.

Below are shown Lai figure 12 and figure 18 which shows the cross section of dimples 80 from top down figure 12.

U.S. Patent May 1, 2001 Sheet 7 of 12 US 6,224,472 B1

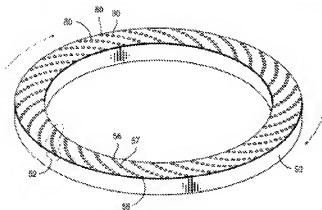
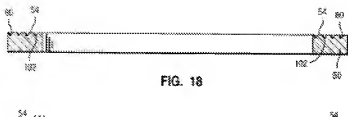


FIG. 12

U.S. Patent May 1, 2001 Sheet 12 of 12 US 6,224,472 B1



Lai Figure 12 clearly shows the dimples 80 do not extend from the inner peripheral surface to the outer peripheral surface of the ring. Therefore figure 12 does not meet the applicant's parent claim limitations.

Lai does not suggest modifying the dimples shown in figures 12 and 18 to meet the applicants' claims. Lai teaches away from applicant's claimed grooves.

Even if it is argued that Lai figure 12 shows a plurality of grooves 52 (two or more grooves), these dimples 52 do not extend to the peripheral surface. The two or more dimples only extend part way between the peripheral surface. It is improper to interpret the imaginary line 52 as the "plurality of grooves" in applicant's unamended claim 37. Unamended claim 37 did not state that "an imaginary line around the plurality grooves extends from said inner peripheral surface to said outer peripheral surface."

Lai Figs. 4, 6, 8, 11, 14 and 20 show rectangular grooves not applicant claimed rounded cross sectional contour grooves

All of the cited Lai figures in the instant Office Action are shown below. No Lai figure shows a applicant's claimed limitation "at least a portion of said first groove has a rounded cross sectional contour".

None of Lai's figures appear to meet the applicant's claim 37-42, 44 46 51 etc, limitations.

As read in Lai's specification, and Figs. 4, 6, 8, 11, 14 and 20, Lai does not show or suggest applicant's limitation in parent claims 37 50 and 55. Lai's other embodiment teach away from applicant's claims.

Therefore parent claims 37 50 and 55 are patentable over Lai.

Claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60 are not anticipated under 35 U.S.C. § 102 by Lai

Amended Claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60 are not anticipated by Lai because Lai does not show or suggest the limitations of the parent claims as discussed above and does not show or suggest the limitations in the dependent claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60.

The instant office action on page 2 argues:

Regarding claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60, Lai et al. meets the limitations, e.g., grooves not intersecting; no annular grooves; linear grooves; radius of about 6.5 mm; and rounded bottom corners.

Claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60 have many novel and obvious elements not in Lai. Some examples are:

claim 39 : ... said plurality of grooves **only communicate between said inner peripheral surface and said outer peripheral surface.**

claim 40 ... 40. The CMP retaining ring of claim 37 wherein each groove said plurality of grooves are linear; and **said plurality of grooves are uninterrupted extending continuously the entire distance from said inner peripheral surface to said outer peripheral surface;** said lower surface does not comprise an annular recess.

All claims that have a limitation that groove extend from the said inner peripheral surface to said outer peripheral surface are not anticipated by Lai.

Amended dependent claims 42 and 57 are non-obvious

Amended dependent claims 42 and 57 are non-obvious. These limitations are not shown or suggested by the combination of references.

Other claims have other non-anticipated limitations.

CLAIM REJECTIONS - 35 USC 103

Rejection of Claims 43, 47, 53, 58 and 61 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Taylor (6,869,335).

The rejection of Claims 43, 47, 53, 58 and 61 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Taylor (6,869,335) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested.

Claim 43 states:

43. (PREVIOUSLY PRESENTED) The CMP retaining ring of claim 37 wherein said first groove has a semicircle profile and said first groove has a rounded top corner adjacent to the lower surface of the retaining ring.

The Office Action p. 3 section 5 states:

Lai et al. meets all of the limitations of the above claims, except for disclosing a rounded top corner (corners contacting the pad).

As discussed above, all parent claims are patentable over Lai. Therefore all dependent claims are patentable over Lai and any combination of references.

The Office Action states:

Taylor teaches that the corners of the grooves contacting the pad can be beveled or rounded. It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the invention Lai et al. with rounded top corners as taught by Taylor to avoid excessive wear of the pad (Taylor 05:32-34).

The Combination Of Lai And Taylor Is Improper

First, the combination of Lai and Taylor is improper because it can only be done with hindsight. Also, neither patent suggest combination. Neither patent solves the same problems or the problem of the applications embodiments. Taylor is a weak reference, because Taylor (Taylor 05:32-34) is only a 3 line cite, is not shown in any figure or claim and is only a minor point of Taylor.

There is insufficient motivation to combine Lai and Taylor. Lai does not mention the applicant's top rounded corners. Lai specifically teaches straight top corners. Lai teaches against the applicant's top rounded corners and Taylor figures.

The combination of Lai and Taylor renders a main purpose of Lai invention inoperable. See MPEP 2143.01 ¹

Lai col. 4 L12 to L 30

The first surface features may include a plurality of protrusions, recesses, or mixture thereof; the first surface features being outwardly inclined relative to the direction of relative rotation between the lower surface of the retaining ring and the upper surface of the pad to **impart dynamic peripheral stretching action to the upper surface of the pad** in a direction away from a portion of the pad adjacent the substrate toward a portion of the pad in contact with the lower surface of the retaining ring. The first surface features may include a plurality of recesses, the recesses being defined as at least one of grooves, dimples, or a mixture thereof.

¹ If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)

The purpose of Lai's grooves in Lai's Ring is to put tension on the CMP pad. See also, Lai col. 14, L 10 to L 27 that specifically mention Lai figure 12 dimples.

If Lai grooves were modified by Taylor to have a rounded groove top corner, then Lia's grooves would be inoperable as Lia intended. The Taylor rounded corners that "reduce pad wear" would reduce the ring's grip on the pad and therefore reduce Lia's purpose of "stretching action on the top surface of the pad." **Therefore Lai teaches directly against the modification by Taylor rounded top groove corners.**

Claims 43, 47, 53, 58 and 61 depend from non-obvious parent claims are therefore non-obvious. Claims 43, 47, 53, 58 and 61 have further non-obvious limitations.

Rejection of Claims 45, and 49 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. (6,656,019).

The Rejection of Claims 45, and 49 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. (6,656,019) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested.

The instant office action states:

Lai et al. meets all of the limitations of the above claims, except for disclosing a flat bottom and curved sidewall. Chen et al. teaches groove for delivering slurry of varying shapes. It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the invention of Lai et al. with different shapes, i.e., S3 as taught by Chen et al. to avoid accumulation of debris (Chen et al. 10:08-13).

Regarding curved and slanted sidewalls, Lai et al. as modified by Chen et al., meets all the limitations, and suggests that the grooves may be of any shaped situated for the particular application, and it is also noted that, it has been held that changing shape, dependent on workpiece parameters, involves only routine skill in the art. In re Stevens, 101 US PQ 284(CCPA1954), and further it would have been obvious to one having

ordinary skill in the art at the time the invention was made to make the sidewall curved to enhance prevention of accumulation, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Reference Chen et al. (US 6,656,019)

Chen shows a CMP pad having grooves. See (Abstract, see claim 1).
Chen does not refer to “retaining ring” or “ring” anywhere in the patent.

Combination of Lai and Chen is improper

The combination of Lai and Chen is improper for many reasons and factors.

No motivation to combine- references do not acknowledge the problem the invention solves-- There is no motivation to combine the references to meet applicant’s claimed 37 50 and 55 embodiments. The applicant found the problem of micro scratches in wafers caused by particles that accumulate in grooves in CMP retaining rings. See figure 2C and spec. p. 10, LL 14 – 21. Neither Lai or Chen suggest the problem of scratched or particles in grooves in a retaining ring. Therefore, since neither reference discloses the problem, there is no motivation to combine the references. Even if Chen teaches improved shapes for grooves in PAD for delivering slurry to avoid accumulation of debris, there is no motivation of combine Chen and Lai because neither reference states the applicant’s problem of particles in the retaining ring grooves.

Support for his non-obviousness it that neither Chen or Lai suggested applicant’s invention. Moreover, CMP retaining ring date back before 1990, millions of dollar have been spend in research and thousands of CMP patents have been issued, yet no one has been able to come up with applicant’s invention. If the applicant’s invention were obvious, someone would have come up with it before now.

Different elements - The combination is improper because Lai involves retaining rings and Chen involves CMP pads. The ring and pad are two distinctly different element that function differently in operation.

Hindsight -- The combination could only be done using hindsight. A clear indication of hindsight is that no other inventor has been able to create the applicant's claims rounded groove, even though CMP tools are over 15 years old, millions of man hours are invested in development and that most tubes that carry slurry in CMP tools have rounded cross sections. Why has no one been able to created applicant's invention if it is so obvious? ____

Different problems - Third, the patents solve different problems and both solve different problems that the applicant's claims.

Long standing need- Fourth, if it was obvious, the applicant's claimed rounded grooves in CMP rings would have been done before. CMP retaining ring art is very crowded and old (since before 1990).

Crowded art - The invention is classified in a crowded art; therefore, a small step forward should be regarded as significant.

Yet no reference suggest the combination or the applicant's claims.

Applicant respectfully posits that this is a misinterpretation of Chen (Chen et al. 10:08-13). Chen shows merely grooves in a CMP pad. No where in Chen does discuss retaining rings. Chen makes no suggestion to put grooves in retaining rings. Moreover, Chen figure 14 teaches against putting grooves into retaining rings by showing a cut away view of a CMP holder 102 that does not have any grooves in the surface that contacts the CMP pad.

The Office Action argument that is obvious to combine and modify the ring with the shape of grooves, not in a retaining ring, but in a soft compressible pad (Chen pad), is weak when the factors of obviousness are considered.

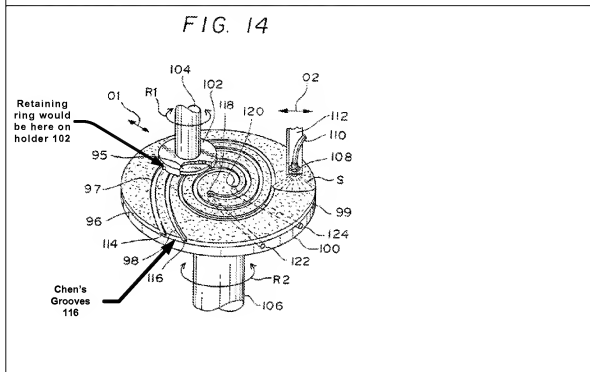
The instant office action further states:

The arguments against the teaching reference, Chen, that it does not disclose a retaining ring, only grooves in the polishing pad is not persuasive. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Here, Chen teaches improved shapes for grooves in delivering slurry to avoid accumulation of debris, clearly applicable to the grooves for a retaining ring, configured for the same purpose, i.e., delivery of slurry.

Applicant respectfully submits that the reference are not being attached individually, but as a whole the combination of references can only be done with hindsight. The Office Action picks a feature from a pad that is not analogous to a retaining ring. The fact that chemical-mechanical polish (CMP) rings and retaining pad have been around since 1980's and that thousands of patents are in the field, that no one has a retaining ring with applicant's claimed groove is a indicating of the non-obviousness of the invention.

Chen (Marked up) figure 14 clearly shows Chen's grooves are in the CMP pad, not in a retaining ring.

Fig 14 has added text labels added by the attorney



Furthermore, Chen figure 13, and especially the Chen (10:08-14), clearly point out the grooves are in the CMP pad. Figure 13 shows merely grooves in a CMP pad.

The dependent claims depend from non-obvious patent claims as discussed above.

Therefore, the applicants' parent claims are non-obvious over the combo of Lai and Chen et al.

The rejection of Claim 48 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. and Taylor.

The rejection of Claim 48 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. and Taylor is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested,

The instant Office Action states:

Lai et al. as modified by Chen et al. and Taylor in sections 5 and 6 meets all of the limitations of claim 48, modifications to avoid excessive wear of the pad (Taylor 05:32-34) and debris accumulation.

Claim 48 states

48. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has vertical sidewalls and an about horizontal bottom and at least one rounded corner between said sidewalls and said horizontal bottom; and rounded top corners near the lower surface of said CMP retaining ring.

As discussed above, the combination of Lai and Taylor is improper. The combination of Lai, Chen and Taylor (top rounded corners) is even more improper. The modification of Lai's dimples with the (Taylor 05:32-34) info to meet claim 48 is non-obvious without hindsight. No where does Taylor suggest or show claim 48's limitations.

Claim 48 depends from a non-obvious parent claim 37 as discussed above.

Claim 48 has further non-obvious limitations.

Address all pending claims

It is believed that all the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper. and the amendment of any claim does not necessarily signify concession of the unpatentability of the claim prior to its amendment.

CONCLUSION

In conclusion, reconsideration and withdrawal of the rejections are respectfully requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone the undersigned attorney at (215) 670-2455 should there be anyway that we could help to place this Application in condition for Allowance.

Charge to Deposit Account

The commissioner is hereby authorized to apply any fees or credits in this case, which are not already covered by check or credit card, to Deposit Account No. 502018 referencing this attorney docket. The Commissioner is also authorized to charge any additional fee under 37 CFR §1.16 and 1.17 to this Deposit Account.

Respectfully submitted,
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